CTE/ROP Civil Engineering and Architecture 1/2

San Diego County Office of Education - Sweetwater Union High School District
Pacing Guide/Course Description

Course Length: 2 Semesters	**Classroom Instruction:** 180 hours
SUHSD Course Number: 97264/97265	**Grade Level:** 10, 11, 12
SDCOE Course Number: 578312	**SDCOE Total Hours:** 180 hours
CBEDS Number/Title: 5704/Civil-Structural Drafting	**Year of Implementation:** 2011
Course Pre-requisites: ROP Introduction to Engineering Design and ROP Principles of Engineering	**Articulation (school/credits):** None
CTE Industry Sector: Engineering and Design	**CTE Pathway(s):** Architectural and Structural Engineering, Engineering Design, Engineering Technology
Job Titles: Civil Engineer, Architect, Architectural and Civil Drafters, Construction and Building Inspectors	
Credential Information: Preliminary or Clear Full-Time Designated Subjects CTE Teaching Credential in Engineering Design	
Required Textbooks: None	
Course Description: Civil Engineering and Architecture is the study of the design and construction of residential and commercial building projects. The course includes an introduction to many of the varied factors involved in building design and construction including building components and systems, structural design, storm water management, site design, utilities and services, cost estimation, energy efficiency, and careers in the design and construction industry. The major focus of the CEA course is to expose students to the design and construction of residential and commercial building projects, design teams and teamwork, communication methods, engineering standards, and technical documentation. Employment opportunities include: drafter and design apprentice. Instruction covers the following areas: mathematics, reading and comprehension, drafting, reading and interpretation of blue prints, project management, sketching, and code compliance. Students use equipment which includes: computers, dial calipers, scale rulers, transponders, CAD software, surveyors levels/transit and plotters.	

Revised 11/07/2011

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Semester 1

Unit A: Career Development
Unit 1: Overview of Civil Engineering and Architecture
- Lesson 1.1: History of Civil Engineering and Architecture
- Lesson 1.2: Careers in Civil Engineering and Architecture

Unit 2: Residential Design
- Lesson 2.1: Building Design and Construction
- Lesson 2.2: Cost and Efficiency Analysis
- Lesson 2.3: Residential Design

Semester 2

Unit B: Career Development
Unit 3: Commercial Applications
- Lesson 3.1: Commercial Building Systems
- Lesson 3.2: Structures
- Lesson 3.3: Services and Utilities
- Lesson 3.4: Site Considerations

Unit 4: Commercial Building Design
- Lesson 4.1: Commercial Building Design Problem
- Lesson 4.2: Commercial Building Design Presentation

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Semester 1 - **Unit A - Career Development (10 hours)**				
Competencies	**Standards**	**Suggested Pacing**	**Essential Vocabulary**	**Resources/Materials**
A - Completes an appropriate resume and job application. **B** - Acquires job interview techniques. **C** - Attains awareness of advanced career and educational opportunities.	**Career Technical Education:** ***ED/CPM/** **3.1** Know the personal qualifications, interests, aptitudes, knowledge, and skills necessary to succeed in careers. **3.2** Understand the scope of career opportunities and know the requirements for education, training, and licensure. **3.6** Know important strategies for self-promotion in the hiring process, such as job applications, résumé writing, interviewing skills, and preparation of a portfolio. **Core Academic:** ***ED/A/1.4VPA/VA/ADV/G9-12/** **(5.3)** Prepare portfolios of their original works of art for a variety of purposes (e.g., review for postsecondary application, exhibition, job application, and personal collection). ***ED/C/2.2W/WSA/G11-12/** **(2.5)** Write job applications and résumés: **a.** Provide clear and purposeful information and address the intended audience appropriately. **b.** Use varied levels, patterns, and types of language to achieve intended effects and aid comprehension. **c.** Modify the tone to fit the purpose and audience. **d.** Follow the conventional style for that type of document (e.g., résumé, memorandum) and use page formats,	**A - 3 hours:** Resume and **2 hours**: Job Application **B – 2.5 hours:** Job interviews **C - 2.5 hours:** Career awareness	Career Characteristics Convicted Description Disability Extracurricular Interview skills Job Application Job Interview Labor Laws Limitations Objective Position Portfolio Previous/Former Reference Referred Resume Salary Skills Strengths	**Teacher Resources:** Job Finder's Guide Employability Skills Handbook (lesson plan examples) http://www.baldyviewrop.com/teachers_staff/lesson_plans.htm **Student Resources:** Master Application Job Finder's Guide www.snagajob.com www.monster.com http://www.ca.gov/Jobs/

	fonts, and spacing that contribute to the readability and impact of the document. ***ED/C/2.3WO/ELC/G11-12/** **(1.2)** Produce legible work that shows accurate spelling and correct punctuation and capitalization. ***ED/C/2.2W/WSA/G11-12/** **(1.6)** Develop presentations by using clear research questions and creative and critical research strategies (e.g., field studies, oral histories, interviews, experiments, electronic sources).			

Suggestions/Assessments:

Resume/Job Application/Letters

- Have students start by writing a Personal Statement (See Job Finder's Guide)
- Have students properly request a job application in person, and/or print one from the Internet. Students should fill out and complete the application. Also have students complete an online job application for a company.
- Use technology to show students exemplary and poor-quality examples of resumes, cover letters, and follow-up letters. Identify the components of business letters and a resume. Have students identify errors in the examples.
- Show Resume PowerPoint presentation and have students fill out a Resume Worksheet with all the information they will need to type in their Resume in order to best prepare and complete the Resume Document.
- Have students prepare a Cover Letter Document, References Document, and Thank you letter Document.

Job Interviews

- Have students type up responses to interview questions. Have students practice with a partner, then present in front of the class.
- Have students participate in mock interviews.

Career Awareness

- Have students visit selected college and university Web sites to discover what courses are taught and what majors are offered in the field of information technology.
- Have students share their findings with the class using electronic presentation software.
- Have students use the online *Occupational Outlook Handbook* (http://www.bls.gov/oco/) to select an area of occupational interest. Have them research salary and educational requirements for the chosen career and then prepare a one-page summary of the information using word processing software or do a multimedia presentation using presentation software, such as Microsoft PowerPoint.
- Have students understand:
  - Keeping informed of the job market will ensure that you have every opportunity to obtain the best jobs available.
  - Well-prepared job candidates perform much better in the job application and interview process and are more likely to be hired for desirable positions.
- Have students conduct a job search.
- Guest Speakers: College representatives, Professional in the Industry

- The teacher will assess the Resume, Cover Letter, References Page and Thank you letter documents, and mock interviews.

Comments:

- At the beginning of the unit, use the **KWL Chart** to determine what students Know and what they Want to know about careers and emerging technologies in the industry. At the end of the unit, use K-W-L to review by having students recall what they have learned.

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Semester 1 - **Unit 1 - Overview of Civil Engineering and Architecture (23 hours)**				
Competencies	**Standards**	**Suggested Pacing**	**Essential Vocabulary**	**Resources/Materials**
1A - Understands Engineering and its History. **1B** - Understands Architecture and its History **1C** - Understand and demonstrate knowledge of multiple Architectural styles that have been developed throughout history and are an indication of the changing need for space and different ways the space was used.	**Career Technical Education:** ***ED/ASEP/** **A1.1** Know significant historical architectural and structural projects and their effects on society. **A1.2** Understand the development of architectural and structural systems in relation to aesthetics, efficiency, and safety. **A2.1** Understand the ways in which sociocultural conditions and issues influence architectural design. **Core Academic:** ***ED/C/2.2W/WSA/G9-10/** (1.3) Use clear research questions and suitable research methods (e.g., library, electronic media, personal interview) to elicit and present evidence from primary and secondary sources.	**Lesson 1.1 –** **13 hours:** History of Civil Engineering	Aesthetics Arch Architect Balance Bearing Walls Civil Engineer Color Contrast Design Principles Dome Element of Design Emphasis Façade Form Keystone Line Lintel Movement Pattern Post-and-Lintel Construction Repetition Rhythm Shape Space Texture Unity Value Vernacular Architecture Voussoir	**Teacher Resources:** Refer to Suggestions/ Assessments section. **Student Resources:** Refer to Suggestions/ Assessments section.

Suggestions/Assessments:

Lesson 1.1

Section 1 – 2 (2 hours)

- The teacher will review **Lesson 1.1 Teacher Notes**
- The teacher will present Concepts, Key Terms, and Essential Questions in order to provide a lesson overview.
- The teacher will distribute and discuss the importance of portfolios, journals, and engineering notebooks and their differences.
- **Note:** The teacher will determine whether students will record their notes in a daily journal, portfolio, or their engineering notebook. For purposes of written directions in the day-by-day for each lesson in this course, it will be assumed students will record their notes in a journal. The journal may be a three-ring binder, spiral bound notebook, composition book or electronic.
- The teacher will distribute Activity 1.1.1 History of Civil Engineering and Architecture.
- The teacher will deliver A History of Civil Engineering and Architecture.ppt. while students record notes in their journals. The teacher should print notes pages for the presentation prior to delivering the presentation using How to Print PowerPoint Notes Pages.
- Students will complete Activity 1.1.1 History of Civil Engineering and Architecture.
- The teacher will assess students using Activity 1.1.1 History of Civil Engineering and Architecture Answer Key**.**
- **Optional:** The teacher may wish to assign Lesson 1.1 Key Term Crossword once the key terms have been introduced.

Section 3 – 4 (2 hours)

- The teacher will present Principles and Elements of Design Applied to Architecture.ppt while students record notes in their journals.
- Students will complete Activity 1.1.2 Design Principles and Elements.

Section 5 – 6 (2 hours)

- The teacher will distribute, explain, and assign Project 1.1.3 Architectural Styles and Project 1.1.3 Architectural Styles Rubric**.**
- The teacher will present the Exemplar Project 1.1.3 Prairie Style Architecture**.ppt** as students take notes in the table provided in Project 1.1.3.
- Students will complete Project 1.1.3 Architectural Styles.

Section 7 – 8 (2 hours)

- Students will present their findings from Project 1.1.3 Architectural Styles.
- The teacher will assess students using Project 1.1.3 Architectural Styles Rubric.

Section 9 – 12 (4 hours)

- The teacher will distribute, explain, and assign Project 1.1.4 Architectural Features and Project 1.1.4 Architectural Features Rubric**.**
- Students will complete Project 1.1.4 Architectural Features.

Section 13 (1 hour)

- The teacher will display student models in the classroom
- Students will review the models and identify the architectural style that is represented by each model.
- The teacher will lead a discussion on the architectural styles during which students may be required to present the elements/features that indicate the style represented.
- The teacher will assess students using Project 1.1.4 Architectural Features Rubric.

Comments:

Semester 1 - **Unit 1 - Overview of Civil Engineering and Architecture**				
Competencies	**Standards**	**Suggested Pacing**	**Essential Vocabulary**	**Resources/Materials**
1D - Demonstrates knowledge of Engineering Technologies	**Career Technical Education:** ***ED/TKS/** **10.2** Understand the importance of technical and computer-aided technologies essential to the language of the Engineering and Design sector **10.7** Understand the need and process to obtain and maintain industry-standard, technical certifications and affiliations with professional organizations, including the American Society for Engineering Education, the Accreditation Board for Engineering and Technology, and the American Society of Civil Engineers. ***ED/EDP/** **C10.2** Use sketching techniques as they apply to a variety of architectural and engineering models.	**Lesson 1.2 –** **10 hours:** Careers in Civil Engineering and Architecture	ABET AIA ASCE Building Code Charrette Construction Documents Municipality NAAB NCARB Stakeholder Zoning Ordinance	**Teacher Resources:** Refer to Suggestions/ Assessments section. **Student Resources:** Refer to Suggestions/ Assessments section.

Suggestions/Assessments:

Lesson 1.2

Section 1 (1 hour)

- The teacher will present Concepts, Key Terms, and Essential Questions in order to provide a lesson overview.
- The teacher will deliver A Career in Civil Engineering and A Career in Architecture presentations**.**
- Students will take notes during the presentation in their journals.
- **Optional:** The teacher may wish to assign Lesson 1.2 Key Term Crossword once the key terms have been introduced.

Sections 2-6 (5 hours)

- The teacher will distribute, explain, and assign Project 1.2.1 This is Your Career and Project 1.2.1 This is Your Career Rubric**.**
- Students will complete Project 1.2.1 This is Your Career with teacher guidance.
- Students will present 20 second career videos.

Section 7 (1 hour)

- The teacher will distribute, explain, and assign Project 1.2.2 Design Charrette**,** Project 1.2.2a Stakeholder Role**,** and Project 1.2.2

Design Charrette Rubric.

- Student teams of 4-6 will be formed. The teacher will assign design scenarios to each team.
- Students will individually complete Project 1.2.2a Stakeholder Role to prepare for a design charrette.

Sections 8-10 (3 hours)

- The teacher will check Project 1.2.2a Stakeholder Roles for completion.
- Student teams will participate in a design charrette.
- The teacher will check for individual meeting notes (per Project 1.2.2 Design Charrette).
- Student teams will present the conclusion of their design charrette to the class.
- (Optional) The teacher will present Concept Map.ppt while students take notes in their journals.
- The teacher will lead a discussion on the relationships among stakeholders involved in the design and construction of a commercial project. The teacher may supervise the creation of a class concept map to represent the relationships or use the Stakeholders in Commercial Project.ppt as a basis of discussion.

Comments:

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Semester 1 - **Unit 2 - Residential Design (55 hours)**				
Competencies	**Standards**	**Suggested Pacing**	**Essential Vocabulary**	**Resources/Materials**
2A - Civil Engineering and Architecture common practices must be identified to develop a viable solution to a project. **2B** - Develop an understanding of proper documentation required in a project. **2C** - Demonstrate a dynamic representation of past performances by organizing an industry standards level portfolio **2D** - Create sketches to quickly record, communicate and investigate ideas. **2E** - Demonstrate effective communication by recording all processes **2F** - Develop an understanding of working drawings to convey the final design solution of a project.	**Career Technical Education:** ***ED/ASEP/** **A3.4** Develop a complete set of architectural plans and drawings. **A7.1** Develop, read, and understand architectural and construction plans, drawings, diagrams, and specifications. **A7.3** Plan the sequence of events leading to an architectural project. ***ED/EDP/** **C10.2** Use sketching techniques as they apply to a variety of architectural and engineering models. **Core Academic:** ***ED/C/2.2W/WSA/G9-10/** **(1.3)** Use clear research questions and suitable research methods (e.g., library, electronic media, personal interview) to elicit and present evidence from primary and secondary sources. ***ED/C/2.2W/G8** **(1.6)** Revise writing for word choice; appropriate organization; consistent point of view; and transitions between paragraphs, passages, and ideas.	**Lesson 2.1 –** **10 hours:** Building Design and Construction	Felt Floor Joists Header House Wrap Insulation Sheathing Siding Sill Solar Orientation Source Reduction Stud Subfloor Sustainability Top Plate Truss	**Teacher Resources:** Refer to Suggestions/ Assessments section. **Student Resources:** Refer to Suggestions/ Assessments section.

Suggestions/Assessments:

Lesson 2.1

Section 1 (1 hour)

- The teacher will present Concepts, Key Terms, and Essential Questions in order to provide a lesson overview.
- The teacher will demonstrate a completed shed based on Activity 2.1.3 Utility Shed Design as an anticipatory set to the lesson and to preview wood frame systems.
- The teacher will deliver Wood Frame Systems.ppt while students take notes in their journals.
- The teacher will distribute, explain, and assign Activity 2.1.1 Wood Frame Systems**.**
- Students will complete Activity 2.1.1 Wood Frame Systems using available resources.
- **Optional:** The teacher may wish to assign Lesson 2.1 Key Term Crossword once the key terms have been introduced.

Section 2 (1 hour)

- The teacher will check assess 2.1.1 Wood Frame Systems using Activity 2.1.1 Wood Frame System Answer Key and lead a class discussion using the conclusion questions to assess students.
- The teacher will deliver Residential Roof Types.ppt while students take notes in their journals.
- The teacher will distribute, explain, and assign Project 2.1.2 Roof Systems and Project 2.1.2 Roof Systems Rubric**.**

Sections 3 – 6 (4 hours)

- The teacher will deliver Residential Wall Systems.ppt while students take notes in their journals.
- Students will complete Project 2.1.2 Roof Systems using available resources.

Sections 7 – 9 (3 hours)

- The teacher will check Project 2.1.2 Roof Systems conclusion questions for completion and assess students using Project 2.1.2 Roof Systems Rubric.
- The teacher will present Utility Shed Construction – An Example.ppt while students take notes in their journals.
- The teacher will distribute, explain, and assign Activity 2.1.3 Utility Shed Design (Revit 2011) and Activity 2.1.3 Utility Shed Rubric
- Students will complete Activity 2.1.3 Utility Shed Design.

Section 10 (1 hour)

- The teacher will check Activity 2.1.3 Utility Shed Design for completion and lead a discussion on expectations for the documentation of the project.
- The students will complete Activity 2.1.3 Utility Shed Design for the next class session.

Comments:

Semester 1 - **Unit 2 - Residential Design**				
Competencies	**Standards**	**Suggested Pacing**	**Essential Vocabulary**	**Resources/Materials**
2G - Develop and understanding of design selection for structures based on factors such as building codes, style, convenience, cost and function **2H** - Understand how windows can lower energy cost in a project **2I** - Identify types of door to comply with fire rating codes **2J** - Identify differences between structural walls and partition walls **2K** - Identity different types of floor **2L** - Represents equipment layout according to customer need and codes.	**Career Technical Education:** ***ED/ASEP/** **A2.2** Understand the theoretical and practical effects of human and physical factors as well as cost analysis on the development of architectural designs. **A2.3** Use the necessary equipment for producing an architectural design and the methods and techniques for employing that equipment appropriately. **A3.1** Understand the influence of community context and zoning requirements on architectural design. **A4.1** Understand the integration of architectural factors, such as soil mechanics, foundation design, engineering materials, and structure design. **A6.2** Use CADD software to develop a preliminary architectural proposal. **A7.1** Develop, read, and understand architectural and construction plans, drawings, diagrams, and specifications. **A7.2** Estimate the materials needed for a project by reading an architectural drawing.	**Lesson 2.2 –** **7 hours:** Cost and Efficiency Analysis	Compression Strength Concrete Design Temperature Differential Fascia Footing Foundation Heat Loss Radiant Heat Rafter Rebar R-Value Sole Plate Square (Quantity of Shingles) Tensile Strength Thermal Conduction Thermal Convection U-Factor	**Teacher Resources:** Refer to Suggestions/ Assessments section. **Student Resources:** Refer to Suggestions/ Assessments section.

Suggestions/Assessments:

Lesson 2.2

Section 1 (1 hour)

- The teacher will present Concepts, Key Terms, and Essential Questions in order to provide a lesson overview.
- The teacher will present Estimating the Cost for the Concrete Pad.ppt while students take notes in their journals.
- The teacher will distribute, explain, and assign Activity 2.2.1 Concrete Pad Estimate and A1-Example Utility Shed Drawing**.**
- Students will complete Activity 2.2.1 Concrete Pad Estimate before the next class session.
- **Optional:** The teacher may distribute Lesson 2.2 Key Term Crossword for homework once the key terms have been introduced.
- NOTE: In preparation for the next day's activity, students should be encouraged to bring in flyers or other material(s) that include current pricing for building materials in their area.

Sections 2 – 3 (2 hours)

- The teacher will check Activity 2.2.1 Concrete Pad Estimate conclusion questions for completion and lead a class discussion using those questions to assess students.
- The teacher will distribute, explain, and assign Activity 2.2.2 Shed Cost Estimate and Building Materials Cost.xls.
- Students will update the prices in the Building Materials Cost.xls and complete Activity 2.2.2 Shed Cost Estimate before the next class session.

Sections 4 – 7 (4 hours)

- The teacher will check Activity 2.2.2 Shed Cost Estimate conclusion questions for completion and lead a class discussion using those questions to assess students.
- The teacher will present Heat Loss and Gain.ppt while students take notes in their journals.
- The teacher will distribute, explain, and assign Activity 2.2.3 Heat Loss and Gain, Transmission Loads.xls, Example Engineering Weather Data and R-Value and Densities Chart.
- Students will update the prices in the Building Materials Cost.xls and complete Activity 2.2.2 Shed Cost Estimate.

Comments:

Semester 2 - **Unit B - Career Development (10 hours)**				
Competencies	**Standards**	**Suggested Pacing**	**Essential Vocabulary**	**Resources/Materials**
A - Completes an appropriate resume and job application. **B** - Acquires job interview techniques. **C** - Attains awareness of advanced career and educational opportunities.	**Career Technical Education:** ***ED/CPM/** **3.1** Know the personal qualifications, interests, aptitudes, knowledge, and skills necessary to succeed in careers. **3.2** Understand the scope of career opportunities and know the requirements for education, training, and licensure. **3.6** Know important strategies for self-promotion in the hiring process, such as job applications, résumé writing, interviewing skills, and preparation of a portfolio. **Core Academic:** ***ED/A/1.4VPA/VA/ADV/G9-12/** **(5.3)** Prepare portfolios of their original works of art for a variety of purposes (e.g., review for postsecondary application, exhibition, job application, and personal collection). ***ED/C/2.2W/WSA/G11-12/** **(2.5)** Write job applications and résumés: **a.** Provide clear and purposeful information and address the intended audience appropriately. **b.** Use varied levels, patterns, and types of language to achieve intended effects and aid comprehension. **c.** Modify the tone to fit the purpose and audience. **d.** Follow the conventional style for that type of document (e.g., résumé, memorandum) and use page formats,	**A - 3 hours:** Resume and **2 hours**: Job Application **B – 2.5 hours:** Job interviews **C - 2.5 hours:** Career awareness	Career Characteristics Convicted Description Disability Extracurricular Interview skills Job Application Job Interview Labor Laws Limitations Objective Position Portfolio Previous/Former Reference Referred Resume Salary Skills Strengths	**Teacher Resources:** Job Finder's Guide Employability Skills Handbook (lesson plan examples) http://www.baldyviewrop.com/teachers_staff/lesson_plans.htm **Student Resources:** Master Application Job Finder's Guide www.snagajob.com www.monster.com http://www.ca.gov/Jobs/

	fonts, and spacing that contribute to the readability and impact of the document. ***ED/C/2.3WO/ELC/G11-12/** **(1.2)** Produce legible work that shows accurate spelling and correct punctuation and capitalization. ***ED/C/2.2W/WSA/G11-12/** **(1.6)** Develop presentations by using clear research questions and creative and critical research strategies (e.g., field studies, oral histories, interviews, experiments, electronic sources).			

Suggestions/Assessments:

Resume/Job Application/Letters

- Have students start by writing a Personal Statement (See Job Finder's Guide)
- Have students properly request a job application in person, and/or print one from the Internet. Students should fill out and complete the application. Also have students complete an online job application for a company.
- Use technology to show students exemplary and poor-quality examples of resumes, cover letters, and follow-up letters. Identify the components of business letters and a resume. Have students identify errors in the examples.
- Show Resume PowerPoint presentation and have students fill out a Resume Worksheet with all the information they will need to type in their Resume in order to best prepare and complete the Resume Document.
- Have students prepare a Cover Letter Document, References Document, and Thank you letter Document.

Job Interviews

- Have students type up responses to interview questions. Have students practice with a partner, then present in front of the class.
- Have students participate in mock interviews.

Career Awareness

- Have students visit selected college and university Web sites to discover what courses are taught and what majors are offered in the field of information technology.
- Have students share their findings with the class using electronic presentation software.
- Have students use the online *Occupational Outlook Handbook* (http://www.bls.gov/oco/) to select an area of occupational interest. Have them research salary and educational requirements for the chosen career and then prepare a one-page summary of the information using word processing software or do a multimedia presentation using presentation software, such as Microsoft PowerPoint.
- Have students understand:
  - Keeping informed of the job market will ensure that you have every opportunity to obtain the best jobs available.
  - Well-prepared job candidates perform much better in the job application and interview process and are more likely to be hired for desirable positions.
- Have students conduct a job search.
- Guest Speakers: College representatives, Professional in the Industry

- The teacher will assess the Resume, Cover Letter, References Page and Thank you letter documents, and mock interviews.

Comments:

- At the beginning of the unit, use the **KWL Chart** to determine what students Know and what they Want to know about careers and emerging technologies in the industry. At the end of the unit, use K-W-L to review by having students recall what they have learned.

Semester 2 - **Unit 3 - Commercial Applications (56 hours)**				
Competencies	**Standards**	**Suggested Pacing**	**Essential Vocabulary**	**Resources/Materials**
3A - Understands and interpret legal description, zoning designations and what improvements may be placed on a specific piece of land. **3B** - Develop and understanding on how to interpret surveying **3C** - Reads maps to locate a property **3D** - Develop and understanding of characteristics and resources implicating a project **3E** - Identify support facilities according to the project's needs **3F** - Demonstrate knowledge of plumbing systems **3G** - Demonstrate knowledge of heating, ventilation and air conditioning **3H** - Understand of electrical systems **3I** - Understand of power requirement according to equipment **3J** - Demonstrate knowledge of lighting distribution in a project **3K** - Knowledge of different protection systems **3L** - Demonstrate knowledge of different detection systems **3M** - Understand fire suppression system	**Career Technical Education:** ***ED/ASEP/** **A2.3** Use the necessary equipment for producing an architectural design and the methods and techniques for employing that equipment appropriately. **A2.4** Use freehand graphic communication skills to represent conceptual ideas, analysis, and design concepts. **A3.1** Understand the influence of community context and zoning requirements on architectural design. **A4.3** Know the various components of structures, including lighting; heating, ventilating, and air-conditioning (HVAC); mechanical; electrical; plumbing; communication; security; and vertical transportation systems. **A4.6** Develop a preliminary building plan by using the appropriate materials. **A5.2** Understand stress-strain relationships of building structures. **A5.3** Understand structural design considerations, including load-bearing relationships of shear walls, columns, and beams. **A5.4** Design a simple structure by using structural analysis principles. ***ED/ENSEP/** **E2.2** Analyze the importance and use of soil, and how soil may be preserved and conserved. **E2.3** Know how to assess and evaluate geological hazards.	**Lesson 3.1 –** **13 hours:** Commercial Building Systems	Ballast Beam Brownfield Building Code Built-up Roof (BUR) Cast-in-Place Concrete Column Concrete Masonry Unit (CMU) Construction Type Curtain Wall Decking Egress Elevated Floor EPDM (Ethylene Propylene Diene Monomer) Exit Exit Access Exit Discharge Fenestration Hybrid Ingress Light Gauge Steel Load Load Bearing Wall Low-Slope Roof Masonry Municipality Non-Load Bearing Wall Occupancy Group Occupant Load Open Web Steel Joist Pitched Roof Ponding	**Teacher Resources:** Refer to Suggestions/ Assessments section. **Student Resources:** Refer to Suggestions/ Assessments section.

3N - Demonstrate knowledge of different security systems	**E2.4** Understand how to read, interpret, and evaluate topographical maps and images.		Precast Concrete Reinforced Concrete Shore Single-Ply Membrane Slab-on-Grade Span Spray Polyurethane Foam (SPF) Stability Strength Structural Efficiency Tilt-up Construction Underlayment Welded Wire Fabric (WWF)	

Suggestions/Assessments:

Lesson 3.1

Sections 1-2 (2 hours)

- The teacher will present Concepts, Key Terms, and Essential Questions in order to provide a lesson overview.
- The teacher will present P3.1.1 Keystone Library Renovation as an anticipatory set to the lesson. The teacher will use the Keystone Library Renovation Preliminary (student version).rvt to illustrate the project.
- The teacher will present Land Use and Development Regulations.ppt while students take notes in their journals.
- The teacher will distribute, explain, and assign Activity 3.1.2 Land Use and Development Regulations
- The teacher will distribute the Keystone Library Site Location Map which is available in the Student Support Documents file**.**
- The teacher will distribute the Keystone Site Plan which is available in the Student Support Documents file.
- The teacher will indicate the location of the pre-printed Noblesville Zoning Map or demonstrate accessing the zoning map on the City of Noblesville, Indiana Planning Department website.
- The teacher will distribute copies of Select Sections of the City of Noblesville, Indiana Code of Ordinances or demonstrate accessing the ordinances at http://www.amlegal.com/library/.
- The teacher will provide copies of the IBC 2009 (or other version of IBC) for use during the activity.
- Students will begin Activity 3.1.2 Land Use and Development Regulations.
- **Optional:** The teacher may wish to assign L3.1 Key Term Crossword Puzzle after all key terms have been introduced.

Section 3 (1 hour)

- Students will continue work on Activity 3.1.2 Land Use and Development Regulations**.**
- Students will complete Activity 3.1.2 Land Use and Development Regulations before the next class.

Sections 4-5 (2 hours)

- The teacher will assess students using Activity 3.1.2 Land Use and Development Regulations Answer Key.
- The teacher will present Commercial Wall Systems.ppt while students take notes in their journals**.**
- The teacher will distribute, explain, and assign Activity 3.1.3 Commercial Wall Systems**.**
- The teacher will distribute the Keystone Library Renovation Preliminary (student version).rvt which is provided in the Student Support Documents folder.
- Students will complete Activity 3.1.3 Commercial Wall Systems before the next class session.

Sections 6-7 (2 hours)

- The teacher will assess Activity 3.1.3 Commercial Wall Systems using the Activity 3.1.3 Commercial Wall Systems Answer Key**.** The teacher will check students' 3D architectural model for incorporation of a new wall.
- The teacher will present Commercial Roof Systems.ppt while students take notes in their journals**.**
- The teacher will distribute, explain, and assign Activity 3.1.4 Commercial Roof Systems.
- Students will complete Activity 3.1.4 Commercial Roof Systems before the next class session.

Section 8 (1 hour)

- The teacher will check Activity 3.1.4 Commercial Roof Systems for completion, including both the written activity and the students' 3D architectural model.
- The teacher will present Commercial Framing Systems.ppt while students take notes in their journals**.**
- The teacher will distribute, explain, and assign Project 3.1.5 Structural Efficiency**.**
- The teacher will distribute the construction materials for Project 3.1.5 Structural Efficiency.
- Students will build a structure for Project 3.1.5 Structural Efficiency.

Section 9 (1 hour)

- The teacher will provide student access to a scale with which to weigh structures.
- Each student group will weigh their structure, complete testing, and revise their structure for Project 3.1.5 Structural Efficiency according to the time constraints in the activity.

Section 10 (1 hour)

- The teacher will conduct the competition for Project 3.1.5 Structural Efficiency and award the *Most Efficient Structure* award.
- Students will work on the report submittal for Project 3.1.5 Structural Efficiency**.**
- Students will complete the report submittal for Project 3.1.5 Structural Efficiency by the end of the lesson.

Sections 11-12 (2 hours)

- The teacher will present Commercial Floor Systems.ppt while students take notes in their journals**.**
- The teacher will distribute, explain, and assign **Activity 3.1.6 Commercial Floor Systems.**

- The teacher will distribute the Keystone 2nd Floor Framing Hollow Core Precast , Keystone 2nd Floor Framing Composite Slab, Composite Floor Deck Load Span Tables, and Hollow Core Load Span Tables which are available in the Student Support Documents folder.
- Students will complete Activity 3.1.6 Commercial Floor Systems before the next class session.

Section 13 (1 hour)

- The teacher will assess Activity 3.1.6 Commercial Floor Systems using the Activity 3.1.6 Commercial Floor Systems Answer Key. The teacher will check students' 3D architectural model for incorporation of the appropriate floor system.
- Students may, at the teacher's discretion, work on the report for Project 3.1.5 Structural Efficiency.
- The teacher will assess Project 3.1.5 Structural Efficiency using the Project 3.1.5 Structural Efficiency Report Rubric.

Comments:

Semester 2 - **Unit 3 - Commercial Applications**				
Competencies	**Standards**	**Suggested Pacing**	**Essential Vocabulary**	**Resources/Materials**
3O - Understand principles of motion and force. Live and dead loads that will affect the structural design of a project **3P** - Understand of various loads **3Q** - Understand wind factors **3R** - Understand snow loads **3S** - Understand dead loads **3T** - Understand live loads **3U** - Will understand different type of roof systems **3V** - Identify different materials that can be used in a roof system. **3W** - Understanding of load calculations for roof members. **3X** - Identify architectural styles depending on the surroundings **3Y** - Identify different types of columns and beams **3Z** - Understand types of materials for columns and beams **3AA** - Identify different types of connections **3BB** - Understand the importance of columns schedules to have a successful project. **3CC** - Understand sizing of members according to the load capacity. **3DD** - Understand different types of foundations	**Career Technical Education:** ***ED/ASEP/** **A4.2** Understand various forces that bear on and within structures, including axial force, shear, torsion, and moment. **A5.1** Understand load transfer mechanisms. **A5.3** Understand structural design considerations, including load-bearing relationships of shear walls, columns, and beams. **A5.4** Design a simple structure by using structural analysis principles. **A9.1** Use the methods and techniques for employing all architectural and structural equipment appropriately. **A9.3** Apply the concepts of architectural and structural engineering to the tools, equipment, projects, and procedures of the Architectural and Structural Engineering Pathway.	**Lesson 3.2 -** **20 hours:** Structures	Allowable Strength ASD Axial Force Beam Beam Analysis Caisson Column Continuous Beam Dead Load Deep Foundation Deflection Deformation Design Load Equilibrium Fixed Support Footing Force Foundation Free-body Diagram Girder Grade Beam Internal Force Kip Lateral Load Live Load Load Load Path Mat (Raft) Foundation Moment about a point P Moment Arm Moment Diagram Nominal Strength Occupancy Category Pile Pin Support Roller (Rocker)	**Teacher Resources:** Refer to Suggestions/ Assessments section. **Student Resources:** Refer to Suggestions/ Assessments section.

3EE - Identify foundations according to soil capacities **3FF** - Understand the importance of drainage to preserve foundation stability.			Support Safety Factor Seismic Load Serviceability Shallow Foundation Shear Diagram Shear Force Simple Beam Span Spread Footing Stability Statically Determinate Beam Statically Indeterminate Beam Strain Stress Structural Engineer Tributary Area Tributary Width Truss Weight Wind Load Yield Stress	

Suggestions/Assessments:

Lesson 3.2

Section 1 (1 hour)

- The teacher will present Concepts, Key Terms, and Essential Questions in order to provide a lesson overview.
- The teacher will distribute a copy of the Design Process, which is included as the last slide in the Introduction to Structural Design.ppt. Print the slide as a handout with two slides per page.
- Students will affix the Design Process handout in their journal and use it as they take notes.
- The teacher will present Introduction to Structural Design.ppt while students take notes in their journals.
- **(Optional)** The teacher will distribute, explain, and assign Project 3.2.1 Structural Forms (Optional).
- **(Optional)** Students will work on Project 3.2.1 Structural Forms (Optional)**.**
- **Optional:** The teacher may wish to assign L3.2a Key Term Crossword Puzzle after the Introduction to Structural Design.ppt and Loads and Load Paths.ppt have been presented.
- **Optional:** The teacher may wish to assign L3.2b Key Term Crossword Puzzle after all key terms in the lesson have been introduced.

Section (Optional)

- Students will complete work on Project 3.2.1 Structural Forms before the next class.
- Students will print and display their poster from Project 3.2.1 Structural Forms**.**
- Students will perform a peer review of posters using Project 3.2.1 Structural Forms Rubric (Optional)**.**

Section 2 (1 hour)

- The teacher will present Loads and Load Paths.ppt while students take notes in their journal.
- The teacher will distribute, explain, and assign Activity 3.2.2 Loads.
- The teacher will distribute Roof Deck Span-Load Table, Importance Factor Table**,** Weight of Materials Table, **and** K-Series Standard ASD Load Table for Open Web Steel Joists**.**
- Students will work on Activity 3.2.2 Loads**.**

Section 3-4 (2 hours)

- Students will complete Activity 3.2.2 Loads and make necessary revisions to Keystone Library Renovation 3D model before the next class.

Section 5 (1 hour)

- The teacher will assess Activity 3.2.2 Loads using the Activity 3.2.2 Loads Answer Key**.**
- The teacher will present Beam Analysis.ppt while students take notes in their journals.
- Students will work on Activity 3.2.3 Beam Analysis.
- Students will complete #1 and #2 of Activity 3.2.3 Beam Analysis before the next class session.

Section 6 (1 hour)

- The teacher will check #1 and #2 of Activity 3.2.3 Beam Analysis for completion and demonstrate the correct solutions using Activity 3.2.3 Beam Analysis Answer Key.
- The students will complete Activity 3.2.3 Beam Analysis before the next class session.

Section 7 (1 hour)

- Students will complete #3-6 of Activity 3.2.3 Beam Analysis before the next class session.

Section 8 (1 hour)

- The teacher will check Activity 3.2.3 Beam Analysis for completion.
- The teacher will present Beam Formula.ppt as students take notes in their journals.
- The teacher will distribute, explain, and assign Activity 3.2.4 Beam Analysis Short Cuts to students.
- Students will use the beam formulas presented in Activity 3.2.4 Beam Analysis Short Cuts to mathematically check solutions to Activity 3.2.3 Beam Analysis.

- The students will revise calculations to Activity 3.2.3 Beam Analysis**,** as needed, to produce the correct results by the next class session.

Section 9 (1 hour)

- The teacher will assess Activity 3.2.3 Beam Analysis using Activity 3.2.3 Beam Analysis Answer Key and demonstrate the correct solutions as needed. Note that Activity 3.2.3 was previously checked for completion only.
- The teacher will present MD Solids software and demonstrate the analysis of simply supported beams.
- Students will use MD Solids to complete Activity 3.2.4 Beam Analysis Short Cuts.

Section 10 (1 hour)

- The teacher will assess Activity 3.2.4 Beam Analysis Short Cuts using Activity 3.2.4 Beam Analysis Short Cuts Answer Key.
- Students will identify any discrepancies between MD Solids analysis and solutions to Activity 3.2.3 Beam Analysis solutions and correct inconsistencies.

Section (Optional)

- The teacher will distribute, explain, and assign Project **3.2 5 Build a Beam** to students.
- Students will complete Project 3.2.5 Build a Beam.
- The teacher will assess Project 3.2.5 Build a Beam using **Project 3.2.5 Build a Beam Rubric**.

Section 11 (1 hour)

- The teacher will present Beam Design.ppt while students take notes in their journals.
- The teacher will distribute, explain, and assign Activity 3.2.6 Beam Design and offer assistance as needed (either individually or whole class).
- The students will complete the Interior Beam Design and the Exterior Beam Design of Activity 3.2.6 Beam Design by the next class session.

Section 12 (1 hour)

- The teacher will assess the Interior Beam Design and the Exterior Beam Design of Activity 3.2.6 Beam Design using Activity 3.2.6 Beam Design Answer Key**.** The teacher will demonstrate correct solutions as necessary.
- The teacher will ask a student to sketch the beam diagram for the girder on column line 3 of Activity 3.2.6 on the board and ask for input from other students.
- The teacher will lead a discussion on the load path from the beams to the girders and establish the correct concentrated loads on the girders.
- Students will complete the design calculations for the Girders on Column Lines 3 and 5 of Activity 3.2.6 Beam Design before the next class session.

Section 13 (1 hour)

- The teacher will assess the design calculations for the Girders on Column Lines 3 and 5 of Activity 3.2.6 Beam Design using

Activity 3.2.6 Beam Design Answer Key and demonstrate correct solutions as necessary.

Section (Optional)

- The teacher will distribute, discuss, and assign Activity 3.2.7 Keystone Library Floor Framing Design (Optional)**.**
- The teacher will distribute Keystone Library Floor Framing Design Check Sheet and explain that students will be assessed by peers using this check sheet.
- Students will complete the hand calculations for Activity 3.2.7 Keystone Library Floor Framing Design.
- The teacher will lead a discussion on the practice of peer checking in engineering design.
- Students will exchange beam and girder designs for Activity 3.2.7 Keystone Library Floor Framing Design and assess another student using the Keystone Library Floor Framing Design Check Sheet**.**
- Students will return calculations and revise their own Activity 3.2.7 Keystone Library Floor Framing Design calculations as necessary.
- Students will verify hand calculations with MD Solids.
- Students will revise their Keystone Library Renovation 3D model to include correct beam and girder sizes and tags.
- The teacher will assess Activity 3.2.7 Keystone Library Floor Framing Design using Activity 3.2.7 Keystone Library Floor Framing Design Answer Key (Optional)**.**

Section 14 (1 hour)

- The teacher will present the Commercial Foundations.ppt while students complete Activity 3.2.8 Foundation Types**.**
- Students will complete Activity 3.2.8 Foundation Types before the next class session.

Section 15 (1 hour)

- The teacher will assess Activity 3.2.8 Foundation Types using Activity 3.2.8 Foundation Types Answer Key.
- The teacher will present Spread Footing Design.ppt while students take notes.
- Teacher will distribute, discuss, and assign Activity 3.2.9 Sizing a Spread Footing**.**
- Students will complete #1 and #2 of Activity 3.2.9 before the next class session.

Section 17 (1 hour)

- The teacher will check #1 and #2 of Activity 3.2.9 Sizing a Spread Footing for completion and demonstrate correct solutions.
- Students will complete #3 and #4 of Activity 3.2.9 Sizing a Spread Footing before the next class session.

Section 18 - 19 (2 hours)

- The teacher will assess #3 and #4 of Activity 3.2.9 Sizing a Spread Footing using Activity 3.2.9 Sizing a Spread Footing Answer Key.
- The teacher will distribute, explain, and assign Activity 3.2.10 Keystone Library Spread Footing Analysis**.**
- Students will complete Activity 3.2.10 Keystone Library Spread Footing Analysis before the next class session.

Section 20 (1 hour)

- Students will exchange Activity 3.2.10 Keystone Library Footing Analysis and check designs for accuracy using Keystone Library Spread Footing Analysis Check Sheet.
- If not done earlier, the teacher will lead a discussion on the practice of peer checking in engineering design.
- Students will exchange Activity 3.2.10 Keystone Library Footing Analysis and assess another student using the Keystone Library Spread Footing Check Sheet**.**
- Students will return calculations and revise their own Activity 3.2.10 Keystone Library Footing Analysis calculations as necessary.
- Students will correct calculations as necessary to obtain a signature from the CHECKER on every page of the calculations.
- The teacher will assess Activity 3.2.10 Keystone Library Spread Footing Analysis using Activity 3.2.10 Keystone Library Footing Analysis Answer Key.
- Students will review the existing foundation plan in **Keystone Library Renovation (student version).rvt** (from Lesson 3.1) and make revisions and annotations as necessary to reflect the new footing designs.

Comments:

Semester 2 - **Unit 3 - Commercial Applications**

Competencies	Standards	Suggested Pacing	Essential Vocabulary	Resources/Materials
3GG - Identify where the water supply is, in order to accommodate the project. **3HH** - Identify where to connect with municipal sewer **3II** - Identify if electrical utilities are underground or by air **3JJ** - Identify how gas is provided to the project **3KK** - Identify different alternatives of providers **3LL** - Identify types of telephony providers and alternative options **3MM** - Understands what the district and state are doing to better manage water supply and how can he be part of it. **3NN** - Identify efficient ways to utilized energy and how to be code compliance.	**Career Technical Education:** ***ED/ASEP/** **A4.3** Know the various components of structures, including lighting; heating, ventilating, and air-conditioning (HVAC); mechanical; electrical; plumbing; communication; security; and vertical transportation systems.	**Lesson 3.3 -** **8 hours:** Services and Utilities	Air Handling Unit (AHU) Circuit Circuit Breaker Cleanout Distribution Panel Drain Drainage Fixture Unit Drainage System Ducts Electric Meter Ground Heat Pump Hot Water Individual Sewage Disposal System Lavatory Main Non-potable Water Outlet Plumbing Fixture Potable Water Riser Sanitary Sewer Sewage Sewer Soil Pipe Stack Storm Sewer Switch Leg Trap Valve Vent Pipe Water Closet Water Distributing Pipe Water Heater Water Meter Water Service	**Teacher Resources:** Refer to Suggestions/ Assessments section. **Student Resources:** Refer to Suggestions/ Assessments section.

Suggestions/Assessments:

Lesson 3.3

Section 1-2 (2 hours)

- The teacher will present Concepts, Key Terms, and Essential Questions in order to provide a lesson overview.
- The teacher will distribute, explain, and assign Activity 3.3.1 Utilities**.**
- Students will work in teams on Part 1 of Activity 3.3.1 Utilities**.**
- **Optional:** The teacher may wish to assign L3.3 Key Term Crossword Puzzle after all key terms have been introduced.

Section 3 (1 hour)

- Students will make presentations per Activity 3.3.1 Utilities.
- Students will assess the presentations of their classmates according to Activity 3.3.1 Utility Presentations Rubric**.**
- The teacher will gather completed rubrics and compile assessments.

Section 4 (1 hour)

- Students will complete Part 2 of Activity 3.3.1 Utilities before the next class session.
- The teacher will assess Part 2 of Activity 3.3.1 Utilities for completion.

Section (Optional)

- The teacher will distribute, explain, and assign Activity 3.3.2 Plumbing **(Optional)** and Example Commercial Plumbing Code Requirements to students**.**
- Students will work on Activity 3.3.2 Plumbing.
- The teacher will check Activity 3.3.2 Plumbing for completion and discuss with the class differences among student designs.

Section (Optional)

- The teacher will distribute, explain, and assign Activity 3.3.3 Wastewater Management **(Optional).**
- Students will complete Activity 3.3.3 Wastewater Management**.**
- The teacher will assess Activity 3.3.3 Wastewater Management using the Activity 3.3.3 Wastewater Management Answer Key **(Optional).**

Section 5-6 (2 hours)

- The teacher will present Energy Codes.ppt while students take notes in their journals.
- Students will work on Activity 3.3.4 Energy Codes.
- Students will complete Activity 3.3.4 Energy Codes before the next class session.
- The teacher will assess Activity 3.3.4 Energy Codes using Activity 3.3.4 Energy Codes Answer Key.

Section (Optional)

- The teacher will distribute, explain, and assign Activity 3.3.5 Electrical Systems **(Optional)**.
- Students will complete Activity 3.3.5 Electrical Systems before the next class session.
- The teacher will assess Activity 3.3.5 Electrical Systems using Activity 3.3.5 Electrical Systems Answer Key (Optional).

Section 7 (1 hour)

- The teacher will present Heating, Ventilating, and Air-Conditioning.ppt as students take notes in their notebooks.
- The teacher will distribute, explain, and assign Activity 3.3.6 Heating, Ventilating, and Air-Conditioning Systems and Drawing M101 – Mechanical Plan to students.
- Students will work on Activity 3.3.6 Heating, Ventilating, and Air-Conditioning Systems.

Section 8 (1 hour)

- Students will complete Activity 3.3.6 Heating, Ventilating, and Air-Conditioning Systems before the next class session.
- The teacher will assess Activity 3.3.6 Heating, Ventilating, and Air-Conditioning Systems for completion on the next class day.

Comments:

Semester 2 - **Unit 3 - Commercial Applications**				
Competencies	**Standards**	**Suggested Pacing**	**Essential Vocabulary**	**Resources/Materials**
3OO - Demonstrate an understanding of ordinances that must be followed in the design of a project. **3PP** - Understands site access, utility availability as well as diverse alternatives if necessary **3QQ** - Evaluates factors that will influence location of a structure or building. **3RR** - Understands site access and overall flow of people and traffic. **3SS** - Understands that landscaping is use to improve the aesthetics of a property	**Career Technical Education:** ***ED/ASEP/** **A3.3** Develop a preliminary proposal for a simulated architectural design. **A9.2** Apply conventional architectural and structural processes and procedures accurately, appropriately, and safely. **A9.3** Apply the concepts of architectural and structural engineering to the tools, equipment, projects, and procedures of the Architectural and Structural Engineering Pathway. **A4.3** Know the various components of structures, including lighting; heating, ventilating, and air-conditioning (HVAC); mechanical; electrical; plumbing; communication; security; and vertical transportation systems. ***ED/ENSEP/** **E1.3** Organize and complete site plans. **E2.2** Analyze the importance and use of soil, and how soil may be preserved and conserved. **E2.3** Know how to assess and evaluate geological hazards. **E2.4** Understand how to read, interpret, and evaluate topographical maps and images. **E2.6** Analyze soil erosion and identify the causes	**Lesson 3.4 -** **15 hours:** Site Considerations	Angle of Repose Back-sight Bench Mark (BM) Closure Error Coarse Grained Soil Construction Survey Control Survey Datum Design Storm Detention Pond (Dry Pond) Differential Leveling Duration Egress Elevation Field Notes Fine Grained Soil Finish Grade Foresight Geodetic Survey Grading Height of Instrument Impervious Ingress Initial Point Land Surveying Liquid Limit Low Impact Development Plane Survey Plastic Limit Plasticity Index Poorly Graded Property Survey Rainfall Intensity Retention Pond (Wet Pond) Return Period	**Teacher Resources:** Refer to Suggestions/ Assessments section. **Student Resources:** Refer to Suggestions/ Assessments section.

			Rod Intercept Runoff Coefficient Stadia Storm Water Wetlands Topographic Survey Well Graded	

Suggestions/Assessments:

Lesson 3.4

Section 1 (1 hour)

- The teacher will present Concepts, Key Terms, and Essential Questions in order to provide a lesson overview.
- The teacher will distribute a copy of the blank Survey Field Notebook to students and then present Land Surveying.ppt while students take notes.
- Students will begin Activity 3.4.1A Differential Surveying.
- **Optional:** The teacher may wish to assign Lesson 3.4a Key Terms Crossword Puzzle after Land Surveying.ppt and Surveying a Level Loop.ppt (Day 3) have been presented.
- **Optional:** The teacher may wish to assign Lesson 3.4b Key Term Crossword Puzzle after all key terms have been introduced.

Section 2 (1 hour)

- Students will complete Activity 3.4.1A Differential Surveying**.**

Section 3 (1 hour)

- The teacher will assess Activity 3.4.1A Differential Surveying by comparing results across groups.
- The teacher will present Surveying a Level Loop.ppt while students take notes.
- Students will begin Project 3.4.1B Control Survey.

Section 4 (1 hour)

- Students will complete the field work for Project 3.4.1B Control Survey.

Section 5 (1 hour)

- Students will complete Project 3.4.1B Control Survey.
- The teacher will check Project 3.4.1B Control Survey for completion and spot-check calculations.
- The teacher will present Parking Lot Design.ppt while students take notes in their notebooks. The teacher may distribute copies of the Stuart Engals II Civil Drawings (preferably 11 x 17 or larger) to groups of students as she presents the final slide in the presentation.
- The teacher will distribute, explain, and assign Activity 3.4.2 Parking Lot Design.
- Students will work on Activity 3.4.2 Parking Lot Design and complete code research before the next class session.

Section 6 (1 hour)

- Students will complete Activity 3.4.2 Parking Lot Design for the next class session.

Section 7 (1 hour)

- The teacher will check Activity 3.4.2 Parking Lot Design for completion and incorporation of major assignment requirements.
- The teacher will distribute, explain, and assign Activity 3.4.3 Soil Testing.
- Students will prepare to perform Activity 3.4.3 Soils Testing during the next class session.
- Teacher may assign Activity 3.4.4 Web Soil Survey for homework.

Section 8 (1 hour)

- The teacher will answer questions regarding Activity 3.4.4 Web Soil Survey and allow students to complete the activity for homework.
- Students will collect data for Activity 3.4.3 Soils Testing**.**

Section 9 (1 hour)

- The teacher will assess Activity 3.4.4 Web Soil Survey using Activity 3.4.4 Web Soil Survey Answer Key.
- Students will analyze data for Activity 3.4.3 Soil Analysis and complete the activity.
- The teacher will check Activity 3.4.3 Soil Analysis for completion based on the results of all groups and spot-check calculations.

Section 10 (1 hour)

- The teacher will distribute, explain, and assign Activity 3.4.5 Storm Water Management**.**
- Students will work on Activity 3.4.5 Storm Water Management and complete #1 and 2 of the activity before the next class session.
- (Optional) Teacher may choose to review the rational formula presented in Storm Water Runoff.ppt in Lesson 2.3.

Section 11 (1 hour)

- The teacher will present Storm Water Storage and Treatment.ppt while students take notes in their notebooks.
- Students will complete #3 and 4 of Activity 3.4.5 Storm Water Management before the next class session.

Section 12 (1 hour)

- The teacher will present Low Impact Development.ppt while students take notes in their notebooks.
- Students will complete Activity 3.4.5 Storm Water Management before the next class session.

Section 13-15 (3 hours)

- The teacher will assess Activity 3.4.5 Storm Water Management using Activity 3.4.5 Storm Water Management Answer Key.
- Students will complete the submittal for Project 3.1.1 Keystone Library Renovation project.

Section (Optional)

- The teacher will present **Landscaping.ppt** while students take notes in their journals.
- The teacher will distribute, explain, and assign **Activity 3.4.6 Landscaping (Optional)**.
- Students will complete Activity 3.4.6 Landscaping (Optional).
- The teacher will check Activity 3.4.6 Landscaping for completion.

Section (Optional)

- The teacher will present Site Grading.ppt while students take notes in their journals.
- The teacher will distribute, explain, and assign Activity 3.4.7 Cut and Fill (Optional) and Activity 3.4.7A Hillside Cut and Fill Drawings (Optional).
- Students will complete Activity 3.4.7 Cut and Fill and Activity 3.4.7A Hillside Cut and Fill before the next class session.
- The teacher will check Activity 3.4.7 Cut and Fill and Activity 3.4.7A Hillside Cut and Fill for completion and to ensure reasonable solutions.

Section (Optional)

- The teacher will present the Road Design.ppt while students take notes in their notebooks.
- The teacher will distribute, explain, and assign Activity 3.4.8 Road Design (Optional) and Activity 3.4.8A Road Chart (Optional).
- Students will complete Activities 3.4.8 Road Design and Activity 3.4.8A Road Chart before the next class session.
- The teacher will assess Activity 3.4.8 Road Design and Activity 3.4.8A Road Chart using Activity 3.4.8 Road Design Answer Key (Optional) and Activity 3.4.8A Road Chart Answer Key (Optional).

Comments:

Semester 2 - **Unit 4 - Commercial Building Systems (31 hours)**

Competencies	Standards	Suggested Pacing	Essential Vocabulary	Resources/Materials
4A - Identify site improvements required to make a site usable **4B** - Understands the necessary design for a project. **4C** - Is aware of all the utilities to take care before an excavation is executed	**Career Technical Education:** ***ED/ASEP/** **A2.3** Use the necessary equipment for producing an architectural design and the methods and techniques for employing that equipment appropriately. **A4.1** Understand the integration of architectural factors, such as soil mechanics, foundation design, engineering materials, and structure design. **A4.6** Develop a preliminary building plan by using the appropriate materials. ***ED/ENSEP/** **E1.3** Organize and complete site plans. **E2.2** Analyze the importance and use of soil, and how soil may be preserved and conserved. **E2.3** Know how to assess and evaluate geological hazards. **E2.4** Understand how to read, interpret, and evaluate topographical maps and images. **E2.6** Analyze soil erosion and identify the causes	**Lesson 4.1 - 23 hours:** Commercial Building Design Problem	Architectural Programming Architectural Program Baseline Bearing Benchmark (BM) Gantt Chart Land Patent Metes and Bounds Plat Principal Meridian Project Management Public Land Survey System Range Rectangular Survey System Section Setback Township Viability Analysis	**Teacher Resources:** Refer to Suggestions/ Assessments section. **Student Resources:** Refer to Suggestions/ Assessments section.

Suggestions/Assessments:

Lesson 4.1

Section 1 (1 hour)

- The teacher will present Concepts, Key Terms, and Essential Questions in order to provide a lesson overview.
- The teacher will distribute, explain, and assign Problem 4.1.1 Commercial Building Design Problem**, Problem 4.1.1 Commercial Building Design Problem Rubric** and present **Exemplar Commercial Projects.ppt** as an anticipatory set to the lesson.
- The teacher will assign or allow the students to form teams of three to four students.

- The teacher will present Teamwork.ppt while students take notes in their journals.
- The teacher will distribute, explain, and assign Activity 4.1.2 Team Building and Activity 4.1.2A Team Role Descriptions.
- Students will complete the team challenge for Activity 4.1.2 Team Building.
- **Optional:** The teacher may wish to assign Key Term 4.1 Crossword Puzzle after all key terms have been introduced.

Section 2 (1 hour)

- Students will complete Activity 4.1.2 Team Building in groups.
- The teacher will briefly meet with each group to check Activity 4.1.2 Team Building for completion.

Section 3 (1 hour)

- The teacher will present Legal Descriptions.ppt while students take notes in their journals.
- The teacher will distribute, explain, and assign Activity 4.1.3 Property Description.
- Students will work on Activity 4.1.3 Property Description.

Section 4 (1 hour)

- Students will complete Activity 4.1.3 Property Description before the next class session.

Section 5 (1 hour)

- The teacher will assess Activity 4.1.3 Property Description using Activity 4.1.3 Property Description Answer Key.
- The teacher will read Supplement 4.1.4 Exemplar to the class.
- The teacher will distribute, explain, and assign Activity 4.1.4 Site Discovery and distribute Activity 4.1.4A Site Discovery Checklist.
- Students will work on Activity 4.1.4 Site Discovery.

Section 6 (1 hour)

- Students will complete Activity 4.1.4 Site Discovery before the next class session.

Section 7 (1 hour)

- The teacher will check Activity 4.1.4 Site Discovery for completion.
- The teacher will distribute and explain tomorrow's Activity 4.1.5 Site Visit and Activity 4.1.5A Site Visit Checklist in anticipation of tomorrow's trip to the site.
- The teacher shall gather all necessary equipment for Activity 4.1.5 Site Visit tomorrow.

Section 8 (1 hour)

- Students will complete Activity 4.1.5 Site Visit.

Section 9 (1 hour)

- The teacher will check Activity 4.1.5 Site Visit for completion.

- The teacher may present Selecting a Solution Path.ppt (from Engineering Design and Development) if students are unfamiliar with creating a decision matrix while students take notes in their journals.
- The teacher will distribute, explain, and assign Activity 4.1.6 Commercial Project Viability**, Activity 4.1.6 Commercial Project Viability Rubric** and the Decision Matrix Template**.**
- Students will work on Activity 4.1.6 Commercial Project Viability.

Section 10 (1 hour)

- Students will continue work on Activity 4.1.6 Commercial Project Viability.
- The teacher will assign a due date for Activity 4.1.6 to correspond with Day 14.

Sections 11-12 (2 hours)

- The teacher will present Project Management.ppt while students take notes in their journals.
- The teacher will distribute, explain, and assign Activity 4.1.7 Commercial Project Management and distribute CEA Progress Report Format document.
- Students will work through the tutorial on Creating Gantt Charts and replicate either the MS Word or the MS Excel Gantt chart presented in the tutorial.

Section 13 (1 hour)

- The teacher will provide students with appropriate due dates per Problem 4.1.1 Commercial Building Design Problem per **Example Project Due Dates**.
- Students will work on Activity 4.1.7 Commercial Project Management and/or Activity 4.1.6 Commercial Project Viability and prepare for a meeting with the teacher to discuss the project proposal.

Section 14 (1 hour)

- The teacher will meet with each student team to discuss the project proposal.
- The teacher will assess Activity 4.1.7 Commercial Project Management for completion and Activity 4.1.6 Commercial Project Viability using Activity 4.1.6 Commercial Project Viability Rubric.

Sections 16-23 (8 hours)

- Students will work on Problem 4.1.1 Commercial Building Design and adhere to self-assigned due dates per the group Gantt chart.
- The teacher will provide additional information and supplemental instruction as necessary.
- The teacher will assess Problem 4.1.1 Commercial Building Design per the Problem 4.1.1 Commercial Building Design Rubric.

Comments:

Semester 2 - **Unit 4 - Commercial Building Systems**

Competencies	Standards	Suggested Pacing	Essential Vocabulary	Resources/Materials
4D - Understands the different architectural styles, implications and their impact throughout history	**Career Technical Education:** ***ED/CPM/** **3.6** Know the main strategies for self-promotion in the hiring process, such as job applications, résumé writing, interviewing skills, and portfolio preparation. ***ED/TC/** **4.2** Understand the use of technological resources to gain access to, manipulate, and produce information, products, and services. ***ED/ELR/** **8.3** Understand the role of personal integrity and ethical behavior in the workplace. ***ED/TKS/** **10.2** Understand the importance of technical and computer-aided technologies essential to the language of the Engineering and Design sector.	**Lesson 4.2 -** **8 hours:** Commercial Building Design Presentations		**Teacher Resources:** Refer to Suggestions/ Assessments section. **Student Resources:** Refer to Suggestions/ Assessments section.

Suggestions/Assessments:

Lesson 4.2

Section 1 (1 hour)

- The teacher will present Concepts and Essential Questions in order to provide a lesson overview.
- The teacher will distribute and explain Project 4.2.2A Commercial Project Presentation or Project 4.2.2B Commercial Project Trade Show along with Presentation Checklist, Presentation Evaluation – Guest, Personal Evaluation Rubric, Peer Evaluation Rubric, and Project 4.2.2 Commercial Building Design Presentation Rubric.

Section 2 (1 hour)

- Students will begin working with a team to create a presentation.
- **(Optional)** The teacher will distribute, explain, and assign Project 4.2.1 Creating a Model (Optional).
- **NOTE:** It is strongly recommended that students complete Project 4.2.1 Creating a Model (Optional) if you can build the time into your schedule. Adjust your plans to reflect additional days according to the level of detail expected and available equipment and

materials.

- **NOTE:** A Model Building lesson is available on the Virtual Academy. You can view the lesson with audio or download the presentation as a resource.

Sections 3 – 8 (6 hours)

- Students will complete and carry out their presentations.
- The teacher will assess the presentations using Project 4.2.2 Commercial Project Presentation Rubric and feedback from guests that witnessed or attended the presentations. Attending guests will complete Presentation Evaluation – Guest.
- Students will complete a personal evaluation of their efforts during the design project using the Personal Evaluation Rubric.
- Students will evaluate teammates using the Peer Evaluation Rubric.

Comments: